

What is Claimed is:

1. A method of making a magnetic tunnel junction device, comprising:

forming a magnetic tunnel junction stack;

patterning the magnetic tunnel junction stack;

forming a discrete magnetic tunnel junction stack by etching the magnetic tunnel junction stack;

forming an electrically non-conductive spacer layer on the discrete magnetic tunnel junction stack;

forming a spacer by anisotropically etching the spacer layer;

forming a dielectric layer over the discrete magnetic tunnel junction stack and the spacer;

planarizing the dielectric layer to form a substantially planar surface;

patterning the dielectric layer;

forming a self-aligned via by etching the dielectric layer;

depositing a first electrically conductive material on the dielectric layer and in the self-aligned via;

planarizing the first electrically conductive material to form a via positioned in the self-aligned via;

depositing a second electrically conductive material on the dielectric layer and on the via;

patterning the second electrically conductive material; and

forming a top conductor by etching the second electrically conductive material.

2. The method as set forth in Claim 1, wherein the depositing of the first electrically conductive material is continued until the first electrically conductive material completely fills the self-aligned via.
3. The method as set forth in Claim 1, wherein the spacer layer is conformally deposited on the discrete magnetic tunnel junction stack.
4. The method as set forth in Claim 1, wherein the spacer layer comprises a material selected from the group consisting of silicon oxide and silicon nitride.
5. The method as set forth in Claim 1, wherein the anisotropically etching the spacer layer comprises a reactive ion etch.
6. The method as set forth in Claim 1, wherein after the forming of the self-aligned via, the discrete magnetic tunnel junction stack and the self-aligned via are not aligned relative to each other.

7. A method of making a magnetic tunnel junction device from a previously fabricated discrete magnetic tunnel junction stack, comprising:

forming an electrically non-conductive spacer layer on the discrete magnetic tunnel junction stack;

forming a spacer by anisotropically etching the spacer layer;

forming a dielectric layer over the discrete magnetic tunnel junction stack and the spacer;

planarizing the dielectric layer to form a substantially planar surface;

patterning the dielectric layer;

forming a self-aligned via by etching the dielectric layer;

depositing a first electrically conductive material on the dielectric layer and in the self-aligned via;

planarizing the first electrically conductive material to form a via positioned in the self-aligned via;

depositing a second electrically conductive material on the dielectric layer and on the via;

patterning the second electrically conductive material; and

forming a top conductor by etching the second electrically conductive material.

8. The method as set forth in Claim 7, wherein the depositing of the first electrically conductive material is continued until the first electrically conductive material completely fills the self-aligned via.

9. The method as set forth in Claim 7, wherein the spacer layer is conformally deposited on the discrete magnetic tunnel junction stack.

10. The method as set forth in Claim 7, wherein the spacer layer comprises a material selected from the group consisting of silicon oxide and silicon nitride.

11. The method as set forth in Claim 7, wherein the anisotropically etching the spacer layer comprises a reactive ion etch.

12. The method as set forth in Claim 7, wherein after the forming of the self-aligned via, the discrete magnetic tunnel junction stack and the self-aligned via are not aligned relative to each other.

13. A magnetic tunnel junction device, comprising:

a discrete magnetic tunnel junction stack including a top portion, a bottom portion, and a side portion;

an electrically non-conductive spacer in contact with the side portion;

a dielectric layer surrounding the spacer and including a self-aligned via that extends to the top portion;

a via positioned in the self-aligned via and in contact with the top portion;

a bottom conductor in electrical communication with the bottom portion; and

a top conductor in contact with the via.

14. The magnetic tunnel junction device as set forth in Claim 13, wherein the spacer is made from a material selected from the group consisting of silicon oxide and silicon nitride.

15. The magnetic tunnel junction device as set forth in Claim 13, wherein the self-aligned via and the magnetic tunnel junction stack are not aligned relative to each other.

16. The magnetic tunnel junction device as set forth in Claim 13 and further comprising:

a plurality of the magnetic tunnel devices positioned in a plurality of rows and a plurality of columns of an array;

a plurality of row conductors that are aligned with a row direction of the array;
and

a plurality of column conductors that are aligned with a column direction of the array,

each of the plurality of the magnetic tunnel junction devices is positioned between an intersection of one of the row conductors with one of the column conductors,

wherein the plurality of row conductors comprises a selected one of the top conductor or the bottom conductor, and

wherein the plurality of column conductors comprises a selected one of the top conductor or the bottom conductor.

17. The magnetic tunnel junction device as set forth in Claim 16, wherein the array is a MRAM array.

18. The magnetic tunnel junction device as set forth in Claim 16, wherein the self-aligned via and the magnetic tunnel junction stack are not aligned relative to each other.